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*A Grammar of English Heraldry.* By W. H. ST. JOHN HOPE.

One great merit of these books is that they frequently call attention to neglected subjects, or cut familiar subjects at unfamiliar angles. Thus they should be instrumental in releasing us from the tyranny of the conventional textbook. We ought to have a similar series in America, dealing with subjects of special interest to us, and using American examples in illustration.

T. D. A. COCKERELL

UNIVERSITY OF COLORADO

*The American College: What it is and What it may Become.* By CHARLES F. THWING. New York, Platt & Peck Co. 1914.

President Thwing's "The American College" is a handsome book of 294 pages. Perhaps because the author had already published sixteen volumes in the same general field, the seventeenth gives the reader the impression of being thin in some spots and padded in others. The author must have either an extraordinary memory or an excellent bibliographical card index on academic subjects. At any rate, the quotations scattered through his book, if a little too numerous, are unhackneyed and interesting. His academic experience has been great and his sympathies are keen. There is little or nothing in the book with which one would disagree, and some of the sections are particularly good, as, for example, the discussion of woman's education and the frank confession of our present ignorance as to the differences between men's minds and women's. The book, as a whole, however, suffers from a lack of definite "attack" on the part of the author. It seems addressed to nobody in particular—or rather to different people at different times, students, parents, trustees, millionaires.

Possibly these matters have been discussed in some of the other books by the president of Western Reserve University, but so far as the present volume is concerned there is no mention of what seems to the reviewer to be really the most significant thing to-day—the rapid differentiation throughout the United States of the colleges that mean business from those that do not. There seems to be insufficient

emphasis, also, on the need of developing a sense of individual responsibility on the part of the student, and on that most acute problem which faces every live college, that of distributing the new wine of the present vintage of thought with as little damage as possible to the bottles provided by the previous generation.

F. P. KEPPEL

#### SCIENTIFIC JOURNALS AND ARTICLES

THE contents of the September *Terrestrial Magnetism and Atmospheric Electricity* are as follows: "The Local Magnetic Constant and Its Variations," by L. A. Bauer; "Magnetic Declinations and Chart Corrections Observed on the *Carnegie* from Long Island Sound to Hammerfest, Norway, June to July, 1913," by L. A. Bauer and J. P. Ault; "The Atmospheric-Electric Observations made on the Second Cruise of the *Carnegie*," by C. W. Hewlett; "On Certain New Atmospheric-Electric Instruments and Methods," by W. F. G. Swann; Letters to Editor, Notes and Recent Publications.

#### SPECIAL ARTICLES

##### THE MEASUREMENT OF CHANGES IN THE RATE OF FECUNDITY OF THE INDIVIDUAL FOWL<sup>1</sup>

1. THE purpose of this preliminary note is to call attention to a method of measuring and representing graphically changes in the intensity of ovarian activity, as indicated by rate of ovulation in the domestic fowl. It has been fully established<sup>2</sup> that if one considers the egg production records from a group or flock of hens as a whole there are observable regular and distinct cycles in the production. Thus, we have distinguished in former publications between winter, spring and summer cycles of flock production. It has not hitherto been possible to observe precisely or to measure any such cyclical changes (either

<sup>1</sup> Papers from the Biological Laboratory of the Maine Agricultural Experiment Station, No. 70.

<sup>2</sup> Cf. Pearl, R., and Surface, F. M., "A Biometrical Egg Production in the Domestic Fowl." II. Seasonal Distribution of Egg Production. U. S. Dept. Agr. Bur. Anim. Ind. Bulletin 110, Part II., pp. 81-170, 1911.

of long or short period) in the egg production of a single individual bird, owing to the fact that the production is in discrete units. Yet while the end products of ovarian activity are discrete units there are very strong reasons for supposing that physiologically the elaboration—or production in the broad sense—of eggs by the ovary is a continuous process. This matter has been rather fully discussed in a former paper from this laboratory.<sup>3</sup> Evidence of another sort for the continuity (in the mathematical sense) of ovarian activity has recently been given by Gerhartz<sup>4</sup> in a valuable paper on metabolism in the fowl.

2. By a simple statistical expedient it is possible to represent the changes in rate of fecundity in an individual bird as a continuous curve, of which the ordinates represent the rates of egg production on a percentage scale (0 to 100) at the time intervals plotted as abscissæ. This is done by taking, as the rate of fecundity for any given day  $p_n$ , the percentage which the actual number of eggs laid by the bird during the 21 days of which  $p_n$  is the central day, is of 21. Put as a formula, if

$R_{p_n}$  = rate of fecundity (or ovarian activity as indicated by ovulation) on the day  $p_n$ ,

1 = an egg produced,

and  $\Sigma$  denotes summation between the indicated limits, we have

$$R_{p_n} = \frac{100 (\sum_{p_n-10}^{p_n+10} 1)}{21}.$$

The rates so calculated for each successive day may be plotted as a curve.

3. The reasons why 21 days are chosen as the basis of the calculation rather than some other odd number of days will be fully discussed in the complete paper. Here it need only be said that there are good biological grounds for this choice. Gerhartz<sup>5</sup> has shown, for example, that this number repre-

sents about the average number of oocytes to which any appreciable addition of yolk is being made at any given instant of time.

4. Applying this method to records of one, two and three year old hens many interesting and novel points regarding ovarian activity, as expressed in ovulation, may be made out. The long period secular cycles of production appear much more clearly and precisely than in flock mass statistics. The steady diminution in maximum rate of fecundity per unit of time after the first spring cycle in the bird's life is very strikingly shown in the great majority of cases.

This method of measuring fecundity opens the way to the attacking *in the individual* of a number of problems which hitherto have only been amenable to indirect, statistical treatment. Such, for example, are the questions of relation of size of egg to rate of fecundity, the relation between fertility (in the fowl readily measured by hatching quality of eggs) and fecundity. There are many other interesting biological problems relating to reproduction in birds, the analysis of which will certainly be aided by the method here discussed.

The complete paper describing the method and illustrating it fully by examples will shortly be published elsewhere.

RAYMOND PEARL

#### THE NORTH CAROLINA ACADEMY OF SCIENCE

THE North Carolina Academy of Science met in its thirteenth annual session at Trinity College, Durham, on Friday and Saturday, May 1 and 2, 1914, with 28 members in attendance. The executive committee held a meeting in the early afternoon of Friday, and this was followed by a general meeting for the reading of papers. At night, after Dean W. I. Cranford had welcomed the academy to Trinity College, President Franklin Sherman, Jr., of the academy, read his presidential address, "The Animal Life of North Carolina with some Suggestion for a Biological Survey." Following this, Professor A. H. Patterson gave a lecture on "The Gyroscope and its Modern Applications" with demonstrations of some fine apparatus. Next Mr. Bert Cunningham gave a striking demonstration of the new nitrogen tungsten lamp, comparing its light efficiency with that of

<sup>3</sup> Cf. Pearl and Surface, *loc. cit.*

<sup>4</sup> Gerhartz, H., "Ueber die zum Aufbau der Eizelle notwendige Energie (Transformationsenergie)," *Pflüger's Arch.*, Bd. 156, pp. 1-224, 1914.

<sup>5</sup> *Loc. cit.*